HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: Gary Development Landfill

Contact Persons

Site Investigation: Mark Jaworski, Indiana Department of Environmental Management (IDEM), Site Investigation, (317) 233-2407

Documentation Record: Pat Hamblin, United States Environmental Protection Agency (EPA), Region V, (312) 886-6312

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Pathways, Components, or Threats Not Scored

The ground water migration pathway, the soil exposure pathway, the air pathway, and the drinking water threat and human food chain threat of the surface water pathway were not scored as part of this Hazard Ranking System (HRS) evaluation. These pathways/components were not included because a release to these media does not significantly affect the overall site score and because the environmental threat component of the surface water migration pathway produces an overall site score above the minimum required for the site to qualify for inclusion on the National Priorities List (NPL).

HRS DOCUMENTATION RECORD

Name of Site:	Gary Development Landfill
EPA Identification No.:	IND077005916
EPA Region:	5
Date Prepared:	March 2011
Street Address of Site:	479 N. Cline Avenue* (Refs. 62, p. 004; 148)
County/State/Zip Code:	Lake County, Indiana, 46406
General Location in the State:	Northwestern Indiana (Ref. 3)
Topographic Map:	Highland, Indiana Quad (7.5') (Ref. 3)
Latitude:	41° 36' 50.62"N
Longitude:	87° 25' 35.21"W
Site Reference Point:	Approximate center of the source area
Congressional District:	01

* Note: The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

SITE SCORING SUMMARY

Pathway Scores:

Air Pathway	*NS*
Ground Water Pathway	*NS*
Soil Exposure Pathway	*NS*
Surface Water Pathway	*60.00*
HRS SITE SCORE	30.00

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S		S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	NS		
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	60.00		3600.00
2b.	Ground Water to Surface Water Migration Component	NS		
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	60.00		3600.00
3.	Soil Exposure Pathway Score (S_s	NS		
4.	Air Migration Pathway Score (S_a)	NS		
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$			3600.00
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root		30.00	

TABLE 4-1
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor Categories and Factors		Maximum Value	Value Assigned
DRINKING WATER THREAT			
	Likelihood of Release		
1.	Observed Release	550	550
2.	Potential to Release by Overland Flow		
	2a. Containment	10	
	2b. Runoff	25	
	2c. Distance to Surface Water	25	
	2d. Potential to Release by Overland Flow (lines 2a x (2b + 2c))	500	
3.	Potential to Release by Flood		
	3a. Containment (Flood)	10	
	3b. Flood Frequency	50	
	3c. Potential to Release by Flood (lines 3a x 3b)	500	
4.	Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	
5.	Likelihood of Release (higher of lines 1 and 4)	550	550
	Waste Characteristics		
6.	Toxicity/Persistence	a	NS
7.	Hazardous Waste Quantity	a	NS
8.	Waste Characteristics	100	NS
	Targets		
9.	Nearest Intake	50	NS
10.	Population		
	10a. Level I Concentrations	b	NS
	10b. Level II Concentrations	b	NS
	10c. Potential Contamination	b	NS
	10d. Population (lines 10a + 10b + 10c)	b	NS
11.	Resources	5	NS
12.	Targets (lines 9 + 10d + 11)	b	NS
Factor Categories and Factors		Maximum Value	
DRINKING WATER THREAT (Concluded)			
	Drinking Water Threat Score		
13.	Drinking Water Threat Score ((lines 5 x 8 x 12)/82,500, subject to a maximum of 100)	100	NS

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to nearest integer.

HUMAN FOOD CHAIN THREAT		
Likelihood of Release		
14. Likelihood of Release (same value as line 5)	550	NS
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	a	NS
16. Hazardous Waste Quantity	a	NS
17. Waste Characteristics	1,000	NS
Targets		
18. Food Chain Individual	50	NS
19. Population		
19a. Level I Concentrations	b	NS
19b. Level II Concentrations	b	NS
19c. Potential Human Food Chain Contamination	b	NS
19d. Population (lines 19a + 19b + 19c)	b	NS
20. Targets (lines 18 + 19d)	b	NS
Human Food Chain Threat Score		
21. Human Food Chain Threat Score ((lines 14 x 17 x 20)/82,500, subject to a maximum of 100)	100	NS
Factor Categories and Factors	Maximum Value	Value Assigned
ENVIRONMENTAL THREAT		
Likelihood of Release		
22. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/ Bioaccumulation	a	500,000,000
24. Hazardous Waste Quantity	a	10,000
25. Waste Characteristics	1,000	1,000
Targets		
26. Sensitive Environments		
26a. Level I Concentrations	b	0
26b. Level II Concentrations	b	100
26c. Potential Contamination	b	0
26d. Sensitive Environments (lines 26a + 26b + 26c)	b	
27. Targets (value from 26d)	b	100
Environmental Threat Score		
28. Environmental Threat Score ((lines 22 x 25 x 27)/82,500, subject to a maximum of 60)	60	60.00
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE FOR A WATERSHED		
29. Watershed Score[c] (lines 13 + 21 + 28, subject to a maximum of 100)	100	60.00
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE		
30. Component Score (S_{of})[c], (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100	60.00

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to nearest integer.

Figure 1-1

Site Location Map, Gary Development Landfill
Gary, Lake County, Indiana (U.S. EPA ID: IND077005916)

0 75 150 Meters

0 250 500 Feet

Sources:

Non Orthophotography Data
- Obtained from the State of Indiana Geographic Information Office Library
- Approximate Site Boundary based on Lake County parcels.

Parcel ID: 45-03-35-301-003.000-004 15.777 acres
Parcel ID: 45-03-35-326-001.000-004 5.9 acres
Parcel ID: 45-03-35-326-002.000-004 40 acres

(Ref. 149, pp. 1-5)

Orthophotography - Obtained from IndianaMap Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

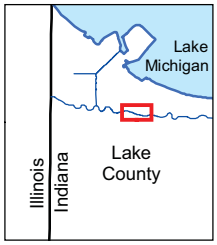
Approximate Center of Site

Approximate Site Boundary

This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By: Mike Hill, Office of Land Quality
Date: 2/18/2009

Site Vicinity



Lake County, IN

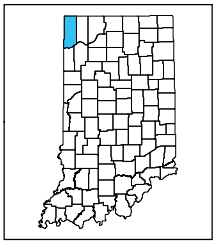
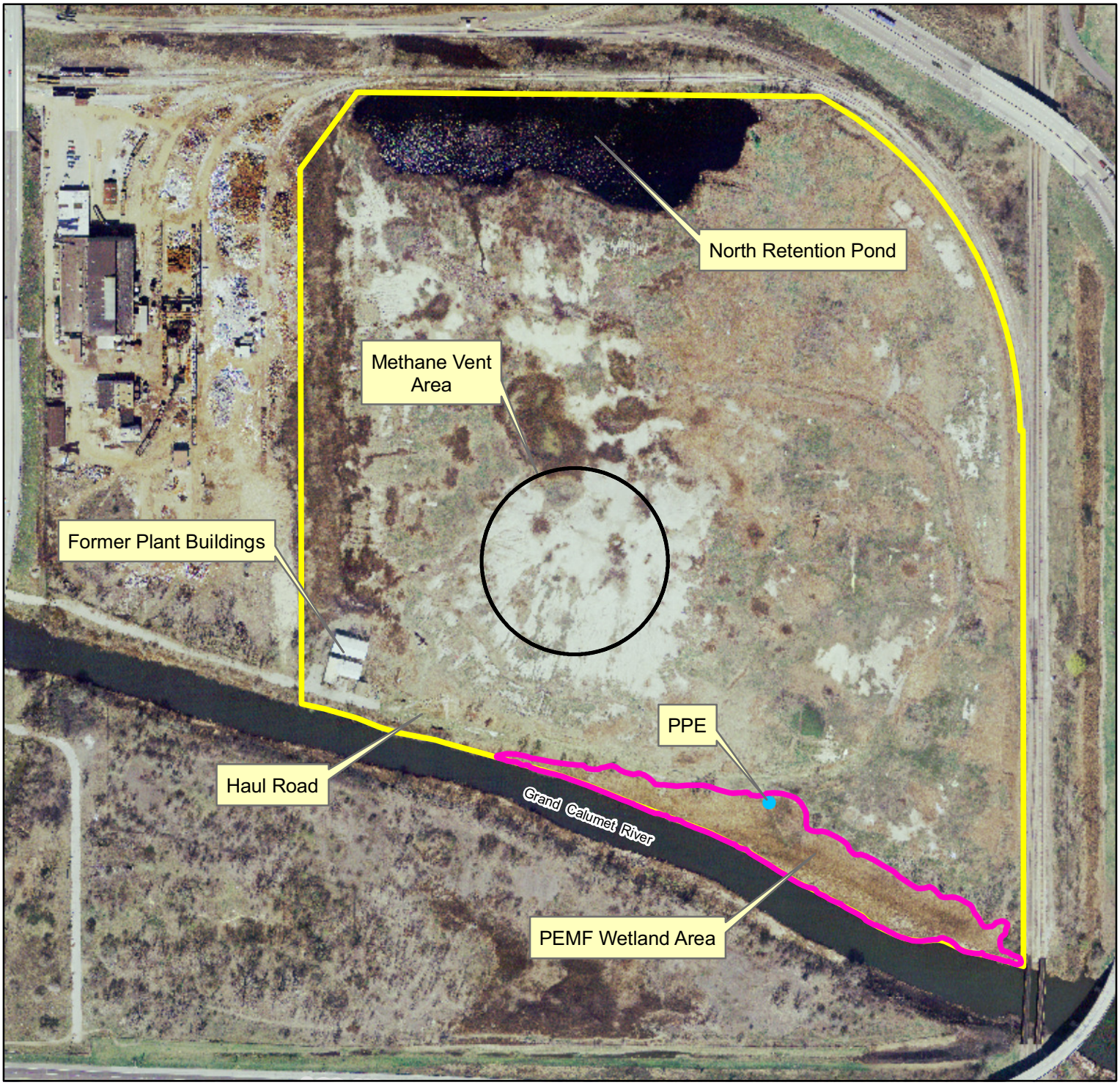


Figure 1-2

Current Site Features (2005), Gary Development Landfill
Gary, Lake County, Indiana (U.S. EPA ID: IND077005916)

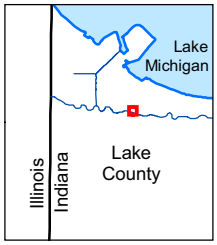


0 50 100 Meters

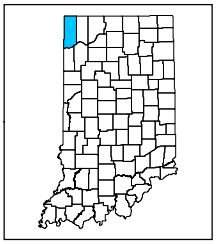
0 250 500 Feet

- Approximate Site Boundary
- Probable Point of Entry (PPE) - 1989
- Wetland Classified PEMF

Site Vicinity



Lake County, IN



Sources:
Non Orthophotography Data
- Obtained from the State of Indiana Geographic Information Office Library

(Ref. 115, pp. 1,2 - PPE; Ref. 131 p. 1 - PEMF Wetland; Ref. 153 p. 1)

Orthophotography - Obtained from IndianaMap Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

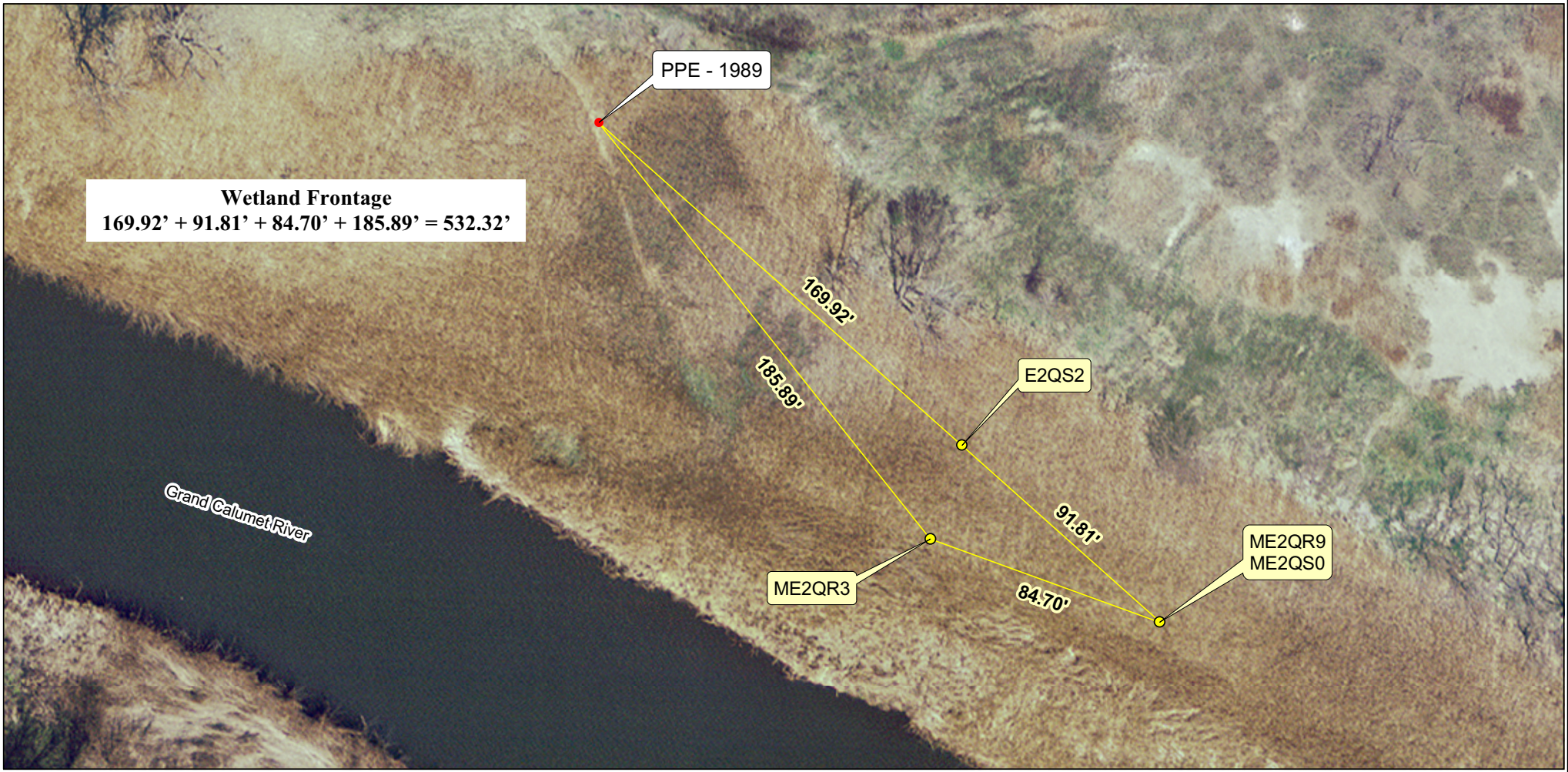
N W E S

This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By: Mike Hill, Office of Land Quality
Date: 8/9/2010

IDEM

Wetland Frontage Map, Gary Development Landfill
Gary, Lake County, Indiana (U.S. EPA ID: IND077005916)



Contaminated Area:
.0955 acres
4,159.98 square feet

(Ref. 121, pp. 27, 28, 29; Ref. 115, p. 1)

Sources:
Non Orthophotography Data
- Unpermitted Discharge Point location obtained from the State Land Office, 1989 Digital Aerial Photography
Orthophotography - Obtained from IndianaMap Framework Data (2005 Digital Orthophotography)
(www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By: Mike Hill, Office of Land Quality
Date: 5/25/2010

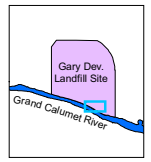
IDEM

- Probable Point of Entry (PPE) - 1989
- Sediment Sample Location
- Sediment Sample Delineation

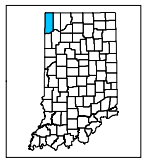
0 5 10 Meters
0 25 50 Feet

N W E S

Site Vicinity



Lake County, IN



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143. U.S. EPA Contract Laboratory Program, National Functional Guidelines for Inorganic Superfund Data Review, January 2010, Excerpt, 7 pages.

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147. Macbeth Division of Kollmorgen Instruments Corporation, Munsell Color Chart, 1994.

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149. IDEM E-Mail to Mark Jaworski from Mike Hill with four attachments, August 5, 2010, 5 pages.

150. IDEM, E-Mail from Bruce Palin to Mark Jaworski Regarding a Waiver to Release Ref. 22 to the Public, January 21, 2011, 1 page.

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SITE SUMMARY – GARY DEVELOPMENT LANDFILL

The Gary Development Landfill (CERCLIS ID No. IND077005916) site consists of the landfill where hazardous substances had been deposited and a release of lead, chromium (total), silver, zinc, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene, into a wetland (Ref. 121, pp., 806-807, 870, 1795-1797, 2287, 2508, 3329, 3468, 4175-4176, 4211, 4217-4218, 4640, 4641, 4646-4647, 4653, 4655, 4658, 4895-4897, 4937-4938, 4974, 4983, 5015).

The Gary Development Landfill, the source, was a permitted solid waste landfill that accepted hazardous waste for disposal (Ref. 31, p. 3; 56, pp. 1, 2, 4, 5; 53, pp. 1, 2; 52, p. 27; 82, p. 1). The landfill neither achieved interim status under RCRA nor obtained a RCRA permit (Reference 48, p.1).

The industrial/sanitary landfill was operated from 1975 to 1989 (Ref. 22, pp. 7, 80; 32. p. 2; 132, p. 1; 150, p. 1). The landfill accepted hazardous substances including volatile organic compounds, semi-volatile organic compounds, heavy metals, and pesticides (Ref. 21, pp. 1, 2; 18; 19; 23, p. 5; 27, p. 2; 33, p. 2; 30, p. 5; 31, p. 3;; 34, pp. 2, 4; 55, pp. 1 through 38; 57, p. 3, 4; 61, pp. 3, 4, 5, 6; 63, p. 1; 64, p. 1; 65, pp. 1 through 8; 66, p. 1; 67, pp. 1, 2; 70, pp. 3, 5, 6, 7; 79, p. 14, 15; 81, p. 17; 84, p. 1; 86, p. 13; 105, p. 5, 6). The landfill ceased accepting waste materials in 1989. (Ref. 22, p. 80; 23, p. 15; 32, p. 2; 33, p. 2; 40, p.2; 47, p. 6; 68, pp. 49, 119; 150, p. 1; 132, p. 1). Not all waste that was deposited into the landfill is known because the operator did not have a detailed waste analysis plan on file for waste it accepted (Ref. 23, p. 6).

The release of hazardous substances occurred into a 2.83 acre wetland, which is adjacent to the southeastern portion of the facility property (Ref. Figure 1-2; 42). The wetland includes habitats known to be used by numerous State endangered species (Ref. 121 pp. 97 through 111, 119 through 152), specifically the marsh wren (*Cistothorus palustris*) (Ref**.** 121, pp. 98, 151, 160, 161, 164, 165, 179)**.** The surface water pathway is the primary pathway of concern.

The probable point of entry (PPE) to surface water is the discharge area from an unpermitted outfall and from other areas at the Gary Development Landfill during its active operations (Ref. 99; 8; 12, pp. 1, 2, 3; 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 30, pp. 2, 3; 39, pp. 9, 10; 90, p. 3; 93, p. 3; 94, p. 3; 132, p. 1; 150, p. 1 Figure 1-2 of this HRS Documentation Record). The facility did not obtain an NPDES permit for any surface water that discharged from the landfill (Ref. 12, p. 2; 26, p. 2; 30, p. 2). Inspection reports completed by the Indiana Department of Environmental Management (IDEM) and USEPA personnel, along with historic aerial photographs reveal that the operator routinely discharged water, which may have come in contact with leachate and other hazardous materials, into the Grand Calumet River where wetlands are present adjacent to the landfill (Ref. 6; 8; 10; 11, pp. 8, 16 through 21; 12, pp. 1, 2, 3; 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 23, pp.17, 58; 24, p. 3; 27, p. 4; 30, pp. 2, 3, 8, 14, 15; 78, pp. 5, 6, 7, 8, 9, 10; 90, p. 3; 94, p. 3; 99; 117, p. 1; 8; Figure 1-2 of this Documentation Record).

An assessment of injury to human uses of fishery resources in the Grand Calumet River and surrounding areas was conducted by the U. S. Fish and Wildlife Service. The primary contaminants of concern addressed in this assessment include the same hazardous substances (i.e. metals, SVOCs, PCBs, and pesticides) as addressed in this Documentation Record (Ref. 95, pp. 29, 98, 103, 111; 102, p. 167). In general, the assessment indicates sediments from the Grand Calumet River and the Indiana Harbor Canal (which are part of the 15-mile surface water migration pathway for the Gary Development Landfill) have concentrations of numerous contaminants in the sediments sufficient to alter the chemical composition of fish tissues to such an extent that the human uses of fishery resources would be adversely affected (Ref. 95, pp. 29, 75, 126 through 495; 102, p. 167). Biological resources such as benthic invertebrates, fish, birds, and mammals were also included in the study and were found to be impacted (Ref. 95, pp. 29, 75, 126 through 495; 102, p. 167).

The landfill was not properly lined and there is no maintained engineered cover and no functioning and maintained run-on control system and runoff management system, enabling hazardous substances to migrate from the landfill into the adjacent wetland located at the south east corner of the landfill (Ref. 117, pp. 1, 2, 3).

While the landfill was active, IDEM inspectors noted that landfill material had been pushed into the

same wetland mentioned above (Ref. 11, pp. 8, 9). The operator did not have permission to perform this action which may have released contaminants into the wetland. The inspectors also noticed several point source discharges of storm water runoff, creating rills and gullies, leaving the property's southern boundary into the Grand Calumet River where the wetland is located (Ref. 11, p. 10; 14, pp. 4, 12; 23, p. 17; 24, p. 3; 38, pp. 5 through 8; 85, pp. 1, 2, 3, 4, 5, 6; 94, p. 3). The runoff was visibly laden with sediment and caused a discoloration of the Grand Calumet River along the facility boundary (Ref. 38, pp. 5 through 8; 85, pp. 1, 2, 3, 4, 5, 6; 106, pp. 1, 7, 10).

Another route of the contamination in the wetland is that the landfill could be leaking into the wetland via ground water. The property of the landfill is geologically unacceptable for waste disposal and is a hazard to ground water and surface-water resources in its vicinity (Ref. 60, p. 2). Because of the highly permeable nature of the Calumet aquifer surrounding the Gary Development Landfill, geologic conditions in the area around and beneath the landfill were not appropriate for the disposal of a hazardous waste (Ref. 92, pp. 5, 7, 15; 141, p. 1). Because of the fact that an engineered liner was never installed at the landfill, and the landfill cap is incomplete and not maintained, a potential exists for the landfill to leak hazardous substances into the adjacent wetlands located at the southeast corner of the landfill (Refs. 71, pp. 5, 6; 78, pp. 3, 4, 5, 6, 7, 8; 92, p. 7; 109, p. 2; 117, pp. 2, 3; 141, p. 1). A potential exists for ground water contamination from the landfill (Ref. 51, p. 1).

The primary hazardous substances of concern in the source are lead, chromium, silver, zinc, and numerous semi-volatile organic compounds (See Section 2.2.2 of this HRS documentation record). A release of these contaminants to the surface water pathway has been documented during an Expanded Site Inspection conducted on May 5, 2009, by IDEM staff (Ref. 121, pp., 806-807, 870, 1795-1797, 2287, 2508, 3329, 3468, 4175-4176, 4211, 4217-4218, 4640-4641, 4646-4647, 4653, 4655, 4658, 4895-4897, 4937-4938, 4974, 4983). All contaminants listed were found at levels three times or more above background.

The site is scored based on releases from the facility that have resulted in Level II contamination of environmental targets, via the surface water pathway (See Section 4.1.4.3 of this HRS documentation record).

Facility Description

The former Gary Development Landfill (GDL) is located at 479 N. Cline Avenue, Gary, Lake County, Indiana (Ref. 23, p. 5; 148). The GDL can be found on the U.S.G.S. Highland, Ind. Quadrangle Topographic Map and in the southwest corner of section 35 in Township 37 North, Range 9 West (Ref. 3). The GDL lies adjacent to the Grand Calumet River about 500 feet west of the Gary Airport south of Lake Michigan (Ref. 47, pp. 6, 7; 76, p. 1; 3). The GDL is within the Grand Calumet River/Indiana Harbor Canal area of concern as outlined by EPA's Great Lakes National Program Office (Ref. 124, pp. 1 through 13).

The facility is bounded to the north and east by E & J Railroad, to the south by the Grand Calumet River, and to the west by AMG (AKA Vulcan Materials). Wetland areas, which have been contaminated by the GDL operations, are present on the southeastern portion of the property (Figure 1-3 of this HRS documentation record). The Gary Development Landfill property consists of 62 total acres, of which approximately 55 acres were utilized for solid and hazardous waste disposal (Ref. 88, p. 3). The Gary Development Landfill is comprised of three (3) parcels (Ref. 45, p. 6; 113, pp. 1, 2, 3, 4, 5; 118, p. 1; 149, p. 1-5).

Facility History

In early 1973, the operator of the landfill began to explore developing a sanitary landfill in a mined-out, water-filled, sand pit (Ref. 15, p.1; 16, p. 1; 87, p. 2). On May 15, 1973, the Indiana Stream Pollution Control Board (SPCB) approved the operator's proposal to dewater the sand pit (Ref. 87, p. 2). On June 19, 1973, SPCB granted the operator's construction permit SW133, allowing preparatory construction work for a sanitary landfill to begin (Ref. 87, p. 2; 69, p. 1). On August 29, 1974, the State conducted its final inspection of the GDL, which led to SPCB's granting final approval to the operator to commence sanitary landfill operation (Ref. 15, p. 1, 2; 16, p. 1; 87, p. 3). The landfill began accepting solid waste for disposal in September, 1974 (Ref. 22, p. 6). On February 20, 1975, SPCB sent the operator its operating permit,

No. 45-2 (Ref. 87, p. 3).

In April, May, and August of 1976, the operator of the landfill was found to have discharged leachate into the Grand Calumet River without an NPDES permit (Ref 49, p. 3; 91, p. 1). Lab analysis of leachate samples taken on August 27, 1976 indicated that significant amounts of heavy metals and oils were being pumped into the Grand Calumet River (Ref. 90, p. 3; 117, p. 1, 2). In 1979 an Agreed Order was filed with the operator to address leachate concerns (Ref.17, pp. 1 through 4).

Inspections conducted by the Indiana State Board of Health found that areas around the working area did not have adequate cover and that fly ash was being used as cover (Ref. 68, pp. 2, 13, 85, 90, 93; 105, p. 1). Other inspections conducted by the Indiana State Board of Health noted that leachate and contaminated water discharged into the Grand Calumet River without an NPDES permit and that fly ash was used as a cover for the landfill (Ref. 68, pp. 6, 8, 11, 17, 19, 22, 28, 29, 31, 34, 35, 38, 39, 40, 41, 45, 49, 50, 51, 53, 55, 56; 49, p. 3; 12, p. 2; 26, p. 2; 27 p. 4; 30, p. 2; 108, p. 1; 112, p. 5). As a result of the inspection findings, the operator was found not in compliance with its construction and operating permit (Ref. 23, p. 14). A Recommended Order regarding the findings was issued on February 16, 1983 (Ref. 15, p. 9).

A review of IDEM records showed that uncontrolled and untreated drainage was allowed to discharge (via pumping or by run-off) directly into the Calumet River when the landfill was active (References 8; 10; 12, pp. 1, 2, 3; 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 27, p. 4; 30, pp. 2, 3; 39, pp. 8, 9, 10; 71, pp. 4, 7; 78, pp. 5, 6, 7, 8, 9, 10; 90, p. 3; 93, p. 3, 94, p. 3; 99; 106, pp. 1, 7, 10; 117, p. 1, 2; 132, p. 1; 150, p. 1). The operator was instructed to maintain a pond to control drainage (Ref. 83, p. 1-2). Inspections conducted in 1984 and 1990 revealed that the operator installed a culvert/drainage pipe under the access road to discharge drainage from the facility (Ref. 12, p. 2; 27, p. 4; 117, p. 1). No NPDES permit was obtained for the discharge (Ref. 12, p. 2; 26, p. 2; 91, p. 1; 30, p. 2).

In 1985, the operator was notified to submit paperwork to operate a hazardous waste facility and submit proof of financial assurance (Refs. 37, pp. 1; 77, p. 1). In 1986, U.S. EPA issued an administrative complaint and compliance order, which alleged that Gary Development Landfill accepted hazardous waste for disposal at their landfill which neither achieved interim status under RCRA, nor obtained a RCRA permit (Ref. 48, p.1; 29, p.10). Gary Development's appeal of this order was dismissed as untimely in August 1996 (Ref. 29, p. 11). The landfill operations ceased in 1989 (Ref. 22, p. 80; 23, p. 12; 32, p. 2; 33, p. 2; 40, p. 2; 47, p. 6; 68, pp. 49, 119; 132, p. 1; 150, p. 1).

An inspection of the GDL was conducted on February 18, 1992 and noted numerous violations of the Indiana Administrative Code (IAC) and Federal Land Disposal Restrictions (Ref. 23, pp. 2 through 7). On January, 30, 1995, other violations were noted (Ref. 110. p. 2). An inspection conducted by U. S. EPA in 1996 also revealed that landfill material had been pushed into the wooded wetland area adjacent to the Grand Calumet River (Ref. 11, p. 7; 39, p. 2).

In August 1996, after negotiations regarding the 1986 complaint and compliance order, a consent decree was issued requiring Gary Development to pay $86,000 in fines and $40,000 into a trust fund (Ref. 28, pp.1, 2; 29, pp. 1, 5, 7, 14, 15, 28, 29, 30, 54, p. 1; 58, pp. 1, 2, 3; 74, p. 1; 103). The monies in the trust fund were to be used for the purpose of performing closure and post-closure care of the landfill, and conducting a ground water quality assessment program. In addition, the monies were to be used for remediation of contamination and/or the prevention of releases of hazardous substances at the facility (Ref. 29, p. 16; 74, p. 9). Current cost estimates for assessments, cover and vegetation, erosion control measures, groundwater monitoring wells, gas system installation-flares, drain and fill ponds, capping, and other work exceed the amount in the trust fund (Ref. 48, p. 2; 78, pp. 3, 4, 5, 6; 88, pp. 3; 89, p. 1). Due to a lack of monies to adequately address closure and post-closure activities at the facility, in 1997, U. S. EPA deferred the facility to CERCLA (Ref. 48, p. 1). In 2001, the landfill was given a Not-Under-Control status (Ref. 73, p. 1).

During a periodic inspection, IDEM staff identified several abandoned drums at the GDL on January 8, 2002 (Ref. 47, pp. 6, 9). As a result, EPA conducted a Time –Critical Removal Action at the Gary Development Landfill. Numerous containers of various substances (oils, paint, insecticides, antifreeze, and electrical capacitors) were removed from the property Ref. 47, pp. 1, 9, 10, 13, 14, 15, 16, 17).

On April 20, 2005, staff from IDEM's Site Investigation Section conducted a Reassessment at the Gary Development Landfill (Ref. 121, p. 21). Ground water and wetland sediment samples were collected (Ref. 121, p. 21). Elevated levels of metals, semi-volatile organic compounds, and pesticides were detected in the wetland samples (Ref. 121, p. 21).

On May 5, 2009, IDEM Site Investigation Section conducted an Expanded Site Inspection at the former Gary Development Landfill (Ref.121, p. 23). Once again, elevated levels greater than three (3) times background of metals, semi-volatile organic compounds, and pesticides were detected in the adjacent wetland samples (Ref.121, 41, 42, 43, 44).

2.2 SOURCE CHARACTERIZATION

The primary source used to score the Gary Development Landfill is the landfill itself.

Figures 1-1, 1-2, and 1-3 of this documentation record depict site location, source area locations, site features, the PPE, and the wetland perimeter on aerial photos of Gary Development Landfill.

2.2.1 SOURCE IDENTIFICATION

Number of the source: 1

Name: Landfill

HRS Source Type: Landfill

Description and Location of the source:

The Gary Development Landfill, the source, was a permitted solid waste landfill (Ref. 56, pp. 1, 2, 3, 4, 5; 53, pp. 1, 2). The landfill neither achieved interim status under RCRA nor obtained a RCRA permit (Reference 48, p.1). The sanitary/industrial landfill accepted materials including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), asbestos, metals, and pesticides (Ref. 21, pp.1, 2; 18; 19; 23, p. 5; 27, p. 2; 30, p.5; 31, p. 3; 33, p. 2; 34, pp. 2, 4; 55, pp. 1 through 38; 57, pp. 3, 4; 61, pp. 3, 4, 5, 6; 63, p. 1; 64, p. 1; 65, pp. 1 through 8; 66, p. 1; 67, pp. 1, 2; 70, pp. 3, 5, 6, 7; 79, pp. 14, 15; 81, p. 17; 84, p. 1; 86, p. 13; 105, pp. 5, 6; 112, p. 30; 119, pp. 1, 2).

Numerous on-property features can be observed based on an aerial photographic analysis of a 1985 photo from when the landfill was active (Ref. 14, pp. 11, 12, 13) which illustrate that drainage was observed flowing south into the Grand Calumet River from the active landfill area.

Runoff, pumping of leachate, ponded water, and uncontrolled drainage from the facility had come into contact with the contaminated waste being deposited into the landfill releasing hazardous substances into the adjacent wetland (Ref. 117, p.1). Leachate, was also produced from the landfill activities and was allowed to discharge from the landfill operation contaminating the adjacent wetland (Ref. 117, pp. 1, 2).

This drainage can be observed throughout most of the history of the landfill by reviewing historical aerial photographs and past inspections (Ref. 6; 8; 10; 11, pp. 8, 9; 12, pp. 1, 2; 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 24, 25, 27, 61, 62, 63, 87; 24, p. 3; 30, pp. 2, 3; 39, pp. 9, 10; 72, p. 3; 78, pp. 5, 6, 7, 8, 9, 10; 91, p. 1; 93, p. 3; 94, p. 3; 99; 106, pp.1, 7, 10; 108, p. 1; 117, pp. 1, 2; 132, p. 1).

An inspection conducted by U. S. EPA in 1996 also revealed that the operator pushed landfill material into the wooded wetland area adjacent to the Grand Calumet River (Ref. 11, pp. 7).

While the landfill was active, inspectors noticed that the operator had used fly ash as cover material (Ref. 68, pp. 6, 8, 11, 17, 19, 22, 28, 29, 31, 34, 35, 38, 39, 40, 41, 45, 49, 50, 51, 53, 55, 56; 49, p. 3; 108, p. 1). This activity was never approved. In addition, the operator conducted fly ash fixation activities at the northeast corner of the GDL property (Ref. 68, pp. 6, 8, 11, 17, 19, 22, 28, 29, 31, 34, 35, 38, 39, 40, 41, 45, 49, 50, 51, 53, 55, 56; 49, p. 3). Foundry sand was also used as cover material (Ref. 68, p. 2, 13, 85, 90, 93). The landfill cap is not complete or maintained (Refs. 71, pp. 5, 6; 117, pp. 2, 3).

Location of the source, with reference to map of the site:

The former Gary Development Landfill is located at 479 N. Cline Avenue, Gary, Lake County, Indiana (Ref. 62, p. 004). The GDL can be found on the U.S.G.S. Highland, Ind. Quadrangle Topographic Map (Ref. 3). The GDL lies in the Southwest corner of Section 35 in Township 37 North, Range 9 West (Ref. 3). The GDL lies adjacent to the Grand Calumet River about 500 feet west of the Gary Airport in an industrial setting south of Lake Michigan (Ref. 3; 47, pp. 6, 7).

Containment:

Inspection reports indicate that a liner had not been adequately placed within the landfill (Ref. 78, pp. 3, 4, 5, 6, 7, 8; 109, p. 2; 117, p. 2). In addition, the geology of the area surrounding the landfill is comprised of sand, gravel, and silts (Ref. 92, p. 5). Such an aquifer provides a very permeable pathway for hazardous constituents to migrate (Ref. 92, p. 7). Since the landfill cap is not complete or maintained, no engineered liner was installed, and the geology of the surrounding area presented a permeable path for the migration of hazardous materials, a potential exists for hazardous materials in the subsurface to migrate from the landfill into the adjacent wetland located at the southeast corner of the property (Refs. 71, pp. 5, 6; 92, p. 7; 141, p. 1; 117, pp. 2, 3). An inspection also noted water was seeping into a hole along the south side of the property (Ref. 68, pp. 20, 21). Seeps and areas ponded with leachate were noted in many inspection reports (Ref. 68, pp. 2, 10, 13, 15, 16, 17, 18, 19, 20, 22, 28, 30, 31, 32, 34, 35, 36, 37, 38, 40, 41, 50, 52, 54, 55, 56, 57, 61, 73, 75, 77, 81, 83, 84, 85, 89, 97, 98, 105; 72, p. 3; 78, pp. 5, 6; 108, p. 1; 109, p. 2; 112, p. 5). The seeps are evidence that hazardous substances could have migrated off-site through the permeable soils of the landfill.

Inspections conducted by the Indiana State Board of Health staff while the landfill was active, revealed that fly ash was used as a cover material for portions of the landfill (Ref. 68, pp. 6, 8, 11, 17, 19, 22, 28, 29, 31, 34, 35, 38, 39, 40, 41, 45, 49, 50, 51, 53, 55, 56; 49, p. 3; 108, p. 1). Fly ash contains heavy metals (i.e., chromium, lead) (Ref. 126, p. 3; 128, p.1). This fly ash was never approved by the State Board of Health for use as cover material. Storm water run-off could come in contact with the fly ash causing heavy metals to dissolve in solution and/or to be transported (via suspended solids of the ash) from the landfill. The landfill cap is not complete or maintained (71, p. 5, 6; 117, pp. 2, 3). This fly ash material was not an approved as an engineered cover and no regular maintenance was ever performed (Ref. 117. p. 3).

There is a potential for this southern perimeter to be leaking hazardous substances into the adjacent wetland from the Gary Development Landfill via the groundwater to surface water pathway. No liner or barrier was constructed in the landfill to inhibit the flow of contaminants to enter the wetland area located on the southern corner of the property (Ref. 117, p. 2). Since ground water flow is in a southern direction toward the Grand Calumet River and the area surrounding the entire landfill is composed of highly permeable sand with some gravel, the landfill is subject to leaking directly into the adjacent wetland area (92, p. 7; 141, p. 1). No samples were collected to substantiate this premise because of the possibility of encountering methane gas pockets from the landfill with the direct push instrument.

The operator did not have a surface water run-on control system but had established a runoff control system (Ref. 68, p. 102; 117, pp. 1, 2). However the operator discharged the runoff directly into the adjacent wetland (Ref. 117, pp. 1, 2). Leachate waters were routinely discharged into the adjacent wetlands via a buried pipe (Ref. Ref. 68, p. 102; 117, p. 1).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Source Samples:

No source samples were obtained. The landfill is considered the source. The table below depicts the wastes and their associated hazardous substances that were deposited into the landfill. The hazardous waste types listed in the table were obtained from court documents, hazardous waste manifests that were sent to the State indicating the amount of waste that was shipped to the landfill, inspection reports by State Board of Health and by U.S. EPA, and RCRA inspection reports (Refer to the references listed for these reports).

SOURCE WASTE TABLE

Wastes Type	Associated Hazardous Substances	Quantity	References
API Separator Bottoms	Acenaphthene, Anthracene, Benzo(a)Anthracene Benzene, Benzo(a)Pyrene, bis(2-Ethylhexyl)phthalate, Chrysene, Di-n-butyl phthalate, Ethylbenzene,	200 cubic yards	81, p. 17; 79, p. 15; 128, p. 2

	Fluorene, Naphthalene, Phenanthrene, Phenol, Pyrene, Toluene, Xylenes, Cyanides (Total), Chromium (Total), Lead, and Nickel		
Paint Sludge (F005)	Lead, Chromium, Cadmium, Barium, Toluene, Methyl Ethyl Ketone	99,000 gallons	55, pp. 2 through 17, 19 through 24, 26 through 38; 128, p. 1
Fly Ash	Mercury, Arsenic, Boron, Cadmium, Lead, Selenium, Cobalt, Aluminum, Barium, Molybdenum, Antimony, Thallium, and Chromium	95,000 cubic yards	68, pp. 6, 8, 11, 17, 19; 81, p. 17; 79, p. 15; 49; 30; 27, p. 21; 128, p. 1
Youngstown Oil Sludge	Various SVOCs as noted for API separator bottoms	Unknown	79, p. 15
K087 (Decanter Tank Tar Sludge)	Benzene, Methyl Ethyl Ketone, Toluene, Xylenes, Acenaphthylene, Anthracene, Benzo(a)Anthracene, Benzenethiol, Benzo(b)Fluoranthene, Benzo(k)Fluoranthene, Benzo(a)Pyrene, Chrysene, Para-Cresol, Fluoranthene, Fluorene, Indeno(1,2,3-cd)Pyrene, Naphthalene, Phenanthrene, Phenol, Pyrene, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc, Cyanide, Fluoride, Sulfide, Styrene, Dibenzofuran, and 2-Methylnaphthalene	312,000 gallons	80, pp. 75 through 356; 128, p. 2; 127, p. 8
Lead Waste/Battery Cases	Lead	60 cubic yards	Ref. 34, p. 4; 30, p. 5; 65, pp. 1 through 8
Foundry Sand	Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver, Copper, Iron, Manganese, Nickel, Sodium, and Zinc	Unknown	68, p. 2, 13, 85, 90, 93; 128, p. 5

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Containment Description	Containment Factor Value	Ref.
Release of hazardous substances via overland migration and/or flood: Elevated levels of metals, and SVOCs were detected in the wetlands located on the southeast corner of the landfill, an observed release of hazardous substances by chemical analysis. The landfill also was not properly lined and there is no maintained engineered cover and no functioning and maintained run-on control system and runoff management system enabling hazardous substances to potentially migrate from the landfill into the adjacent wetland located at the south east corner of the landfill. Note also the landfill inspectors had observed the operator of the landfill to illegally discharge water that had come in contact with hazardous materials from the landfill, into the adjacent wetland without an NPDES permit.	10	Table 4-2, p. 51609; 8; 12, pp. 1, 2; 13, pp.1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 24, 25, 27, 61, 62, 63, 87; 30, pp. 2, 3; 39, pp. 8, 9, 10; 93, p.3, 94, p. 3; 27, p. 2; 33, p. 2; 30, p.5; 31, p. 3; 33, p. 2; 34, pp. 2, 4; 57, pp. 3, 4; 62, pp. 1, 2, 3, 4; 61, pp. 3, 4, 5, 6; 63, p. 1; 64, p. 1; 65, pp. 1 through 8; 66, p. 1; 67, pp. 1, 2; 70, pp. 3, 5, 6, 7; 71, pp. 4, 6, 7; 72, p. 3; 79, pp. 14, 15; 81, p. 17; 84, p. 1; 91, p. 1; 92, p. 7; 97, pp. 1, 2; 98, pp. 1, 2; 105, p. 1; 106, pp. 1, 7, 10; 108, p. 1; 109, p. 1; 78, pp. 3, 4, 5, 6, 7, 8; 92, p. 7; 109, p. 2; 112, p. 5; 117, pp. 1, 2, 3; 132, p. 1, 141, p.1

Notes: NS = Not Scored

2.4.2. HAZARDOUS WASTE QUANTITY

The hazardous substances associated with each waste type are shown in section 2.2.2 of this Documentation Record. The quantity of waste is shown in Section 2.4.2.1.3.

2.4.2.1.1. Hazardous Constituent Quantity

Sufficient information is not available to document a hazardous constituent quantity (Ref. 1, Section 2.4.2.1.1, p. 51590).

Hazardous Constituent Quantity Value (S): NS

2.4.2.1.2. Hazardous Wastestream Quantity

The hazardous substances associated with each waste type are shown in section 2.2.2 of this Documentation Record. The calculation of the volume of each specific waste that was obtained from manifests is shown below:

The table below summarizes the information found in Reference #123. This table shows the total number of waste shipments and the total volume by listed waste category. The individual shipments of waste itemized in Reference #123, were summed as shown below.

Type of Waste (Hazardous Waste Code)	# of Shipments	# of Gallons of Each Shipment	Total Gallons/ Cubic Yards	Reference
F005	36	2,750	99,000 gallons	55, pp. 2 through 38
K087	100	3,000	300,000 gallons	80, pp. 187-326, 328-331, 333-335, 337-356
K087	3	4,000	8,000 gallons	80, pp. 327, 332, 336
Fly Ash	NA	NA	80,000 cubic yards	81, p. 17; 79, p. 15; 30, p. 5; 49, p. 2; 27, p. 6
Fly Ash	NA	NA	15,000 cubic yards	81, p. 17; 79, p. 15; 49, p. 2; 30, p. 5; 27, p. 6
API Separator Bottoms	NA	NA	200 cubic yards	81, p. 17; 79, p. 15

API Separator Bottoms = 200 cubic yards
F005 = 99,000 gallons
K087 = 300,000 + 12,000 = 312,000 gallons
Fly Ash = 80,000 + 15,000 = 95,000 cubic yards

99,000 gallons (F005) + 312,000 gallons (K087) = 411,000 gallons.

Then the 411,000 gallons will be converted to pounds.

According to Table 2-5, on page 51591 of the HRS, 1 ton =2,000 pounds = 1 cubic yard = 4 drums = 200 gallons.

Therefore 411,000 divided by 200 equals 2,055 tons. 2,055 X 2,000 = 4,110,000 pounds (F005 and K087)

95,000 cubic yards (Fly Ash) + 200 cubic yards (API Separator Bottoms) times 2,000 = 190,400,000 pounds

190,400,000 pounds + 4,110,000 pounds =194,510,000 pounds

194,510,000 divided by 5,000 = 38,902 (Hazardous Waste Quantity)

Refer to reference #128 for hazardous substances expected to be associated with each waste.

The volume of waste depicted in the above table was derived from information supplied to the State of Indiana. The complete volume of wastes and type of wastes deposited in the landfill is not known because the operator did not maintain proper waste records.

Hazardous Wastestream Quantity Value (W): 38,902

2.4.2.1.3. Volume

Volume Assigned Value: >NS
(Ref. 1, Table 2-5, p. 51591)

2.4.2.1.4 Area

Area Assigned Value: (NS)
(Ref. 1, Table 2-5, p. 51591)

2.4.2.1.5 Source Hazardous Waste Quantity Value

Ref. 1, p. 51591: 38,902

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

The surface water pathway starts at the southeast edge of the landfill property where discharges occurred into the Grand Calumet River where an emergent wetland is present (Ref. 99; 8;12, pp. 1, 2; 13, pp. 3; 20, pp. 1, 2; 22, pp. 11, 15, 16, 24, 25, 27, 61, 62, 63, 87; 30, pp. 2, 3; 39, pp. 9, 10; 71, pp. 4, 6, 7; 93, p. 3; 94, p. 3; 131, p. 1; 132, p. 1; 150, p. 1). The Gary Development Landfill never had an NPDES permit to discharge water from the GDL (Ref. 12, p. 2; 26, p. 2; 27, p. 4; 30, p. 2; 91, p. 1). Inspection reports, statements from past inspectors, and historical aerial photographs, show that overland flow drainage from the landfill activities was allowed to discharge from a point located on the southeast corner of the landfill (Ref. 99; 8; 12, pp. 1, 2; 13, p. 3; 20, pp. 1, 2; 22, pp. 11, 15, 16, 24, 25, 27, 61, 62, 63, 87; 30, pp. 2, 3; 39, pp. 9, 10; 71, pp. 4, 6, 7; 91, p. 1; 93, p. 3; 94, p. 3; 132, p. 1; 150, p. 1). From the southeast portion of the landfill, un-permitted discharges entered the surface water pathway through an adjacent wetland area. The drainage then flowed into the Grand Calumet River, then entered in the Indiana Harbor Canal, and finally emptied into Lake Michigan (Ref. 3; 100; 101, pp. 1, 2). There are sensitive environments such as wetlands and habitats for endangered species in the area. (Ref. 121, pp. 95 through 112, 119 through 152, 155, 156, 160 through 163, 166 through 169). The environmental threat of the surface water pathway is the only threat that is being scored as part of this HRS Documentation Record.

4.1.1.1 Definition of Hazardous Substance Migration Pathway for Overland/Flood Component

The Gary Development Landfill property is adjacent to the east branch of the Grand Calumet River (GCR). The route for hazardous substances to migrate into the GCR from Gary Development Landfill would be via the probable point of entry (PPE) (See Figures 1-2 and 1-3 of this HRS documentation record). The PPE is the furthest upstream point where hazardous substances enter the surface pathway. The PPE is the point where un-permitted discharges from the landfill were allowed to enter the surface water pathway. From the PPE, the un-permitted discharge flows through .032 miles of an adjacent wetland area. From the wetland surface water enters the Grand Calumet River and flows 2.917 miles to the Grand Calumet River/ Indiana Harbor Canal (IHC) confluence. From this confluence surface water flows 4.079 miles north through the IHC to the Lake George Branch /IHC confluence. From this confluence surface water flows 2.099 miles northeast through the IHC where it enters the southwest corner of the Indiana Harbor. From this point in the Indiana Harbor, surface water flows 5.873 miles through the harbor and enters Lake Michigan where it completes the 15 mile surface water pathway (Ref. 3; 100; 101, pp. 1, 2)

Possible routes for hazardous substances to migrate into the GCR from Gary Development Landfill would be either via the PPE, which discharges directly into the adjacent wetland, and/or via the southern perimeter of the facility, which borders the river, and may be leaking hazardous substances into the wetland from the landfill (Ref. 92, pp. 6, 7; 8; 12, pp. 1, 2, 3; 13, p. 3; 20, pp. 1, 2; 22, pp. 11, 15, 16, 24, 25, 27, 61, 62, 63, 87; 27, p. 4; 30, pp. 2, 3; 39, pp. 9, 10; 90, p. 3; 93, p. 3; 94, p. 3; 117, p. 1, 2).

Note: No appropriate liner was installed in the landfill to prevent the landfill from seeping (Ref. 78, pp. 3, 4, 5, 6, 7, 8; 109, p. 2; 117, p. 2). The furthest upstream PPE of hazardous substances is where the operator installed the discharge pipe on the southeastern edge of the landfill property (See Figures 1-2 to 1-3 of this HRS documentation record). The 15-mile surface water pathway was measured from the PPE of the Gary Development Landfill (Ref. 101, pp. 1, 2).

The hazardous wastes at Gary Development Landfill pose a significant threat to surface water in the area because the source is located in or near surface water (See Figures 1-2 and 1-3 of this HRS documentation record). Several references show that landfill material had been pushed directly into the wetland (Ref. 11, p. 7; 39, pp. 2). The operator did not have permission to conduct this activity. Analysis of samples collected within the wetland indicate the presence of heavy metals such as lead, chromium, silver, and zinc, numerous SVOCs such as acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene (Ref. 121, pp. 806-807, 870, 1795-1797, 2287, 2508, 3329, 3468, 4175-4176, 4211, 4217-4218, 4640, 4641, 4646-4647, 4653, 4655, 4658, 4895-4897, 4937-4938, 4974, 4983; Section 2.2.1 of this HRS documentation record).

Hazardous substances from the source could enter the GCR by migrating through the Gary Development Landfill property and entering the adjacent wetland via surface water runoff (Ref. 8; 12, pp. 1, 2; 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 27, p. 4; 30, pp. 2, 3; 39, pp. 8, 9, 10; 71, pp. 4, 6, 7; 78, pp. 5 through 10; 90, p. 3; 93, p. 3; 94, p. 3; 106, pp. 1, 7, 10; 117, p. 1; 132, p. 1; 150, p. 1). No complete, maintained cap is present (Refs. 71, pp. 5, 6; 117, pp. 2, 3). Due to the sandy and highly permeable nature of the overlying material covering the hazardous waste (Ref. 92, p. 7; 117, p. 2; 141, p. 1), drainage from the facility could have easily percolated through the overlying material coming into contact with the hazardous waste. Drainage/leachate and/or hazardous substances could be pumped/drained from the landfill into the PPE releasing hazardous substances directly into the adjacent wetland (Ref. 12, p. 2; 27, p. 4; 30, pp. 8, 14, 15; 78, pp. 5, 6, 7, 8, 9, 10; 117, p. 1). Run-off from the landfill could have entered directly into the adjacent wetland (Ref. 8;12, pp. 1, 2; 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 27, p. 4; 30, pp. 2, 3; 39, pp. 8, 9, 10; 71, pp. 4, 6, 7; 78, pp. 5 through 10; 90, p. 3; 93, p. 3; 94, p. 3; 99; 106, pp. 1, 7, 10; 117, p. 1; 132, p. 1; 150, p. 1).

An assessment of injury to human uses of fishery resources in the Grand Calumet River and surrounding areas was conducted by the U. S. Fish and Wildlife Service. The primary contaminants of concern addressed in this assessment include the same hazardous substances (i.e. metals, SVOCs, PCBs, and pesticides) as addressed in this HRS Documentation Record (Ref. 95, pp. 29, 98, 103, 111; 102, p. 167). In general, the assessment indicates sediments from the Grand Calumet River and the Indiana Harbor Canal (which are part of the 15-mile surface water migration pathway for the Gary Development Landfill) have concentrations of numerous contaminants in the sediments sufficient to alter the chemical composition of fish tissues to such an extent that the human uses of fishery resources would be adversely affected (Ref. 95, pp. 29, 75, 126 through 495; 102, p. 167). Biological resources such as benthic invertebrates, fish, birds, and mammals were also included in the study and were found to be impacted (Ref. 95, pp. 29, 75, 126 through 495; 102, p. 167).

There is a potential for the southern perimeter to be leaking hazardous substances into the adjacent wetland from the Gary Development Landfill via the groundwater to surface water pathway. No liner or barrier was constructed in the landfill to inhibit the flow of contaminants to enter the wetland area located on the southern corner of the property (Ref.117, pp. 1, 2). Since ground water flow is in a southern direction area toward the Grand Calumet River and the area surrounding the entire landfill is composed of highly permeable sand with some gravel, the landfill is subject to leaking directly into the adjacent wetland area (Ref. 92, p. 7; 117, p. 2; 141, p. 1). No samples were collected to substantiate this premise because of the possibility of encountering methane gas pockets from the landfill with the direct push instrument.

The surface water pathway is the only pathway evaluated for this documentation record.

Likelihood of Release
4.1.2.1.1 Observed Release

An observed release by chemical analysis, to the surface water pathway, is documented for the Gary Development Landfill. Inspection reports and statements reveal that leachate from the hazardous waste deposition areas of the landfill, had come in contact with ponded waters of the pit. The operator pumped these discharging waters which had come in contact with contaminants (i.e. via leachate from the landfill) into the Grand Calumet River (Ref. 8; 12, pp. 1, 2; 13, pp. 1-5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 30, pp. 2, 3, 8, 14, 15; 39, pp. 8, 9, 10; 71, pp. 4, 6, 7; 91, p. 1; 93, p. 3; 94, p. 3; 132, p. 1; 150, p. 1).Chemical analysis of the wetlands, where the discharging waters flowed into, revealed an observed release due to the fact that elevated concentrations of hazardous substances at levels greater than three times background were detected (Refer to the Observed Release by Chemical Analysis of this section). The drainage was occurring from a point located from the southeast corner of the landfill (Ref. 12, p. 2; 26, pp. 2; 27, p. 4; 30, p. 2). An NPDES permit was never issued for this discharge point (Ref. 91, p.1). The operator was known to have pumped ponded water from the landfill directly into the Grand Calumet River (Ref. 12, p. 2; 27, p. 4; 30, pp. 8, 14, 15; 78 pp. 5, 6, 7, 8, 9, 10; 117, p. 1).

As discussed in the Site Summary of this HRS Documentation Record, there is one probable point of entry (PPE). The PPE is considered the discharge point as discussed above. Overland flow (surface water

drainage) came into contact with the waste material that was deposited in the landfill. Leachate was created and was noted throughout inspections when the landfill was active (Ref. 68, pp. 2, 10, 11, 13, 15 through 20, 22,, 28, 30-41, 49-57, , 61, 73, 75, 77, 81, 83-85, 89, 97, 98, 108, p. 1; 109, p. 2;). The leachate waters were allowed to discharge to the adjacent wetland area located along the southeast corner of the landfill from the PPE (Ref. 8; 12, pp. 1, 2; 13, pp. 1 through 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 30, pp. 2, 3, 8, 14, 15; 39, pp. 8, 9, 10; 71, pp. 4, 6, 7; 93, p. 3; 94, p. 3; 99; 132, p. 1; 150, p. 1).

Chemical analysis of wetland soils adjacent to the southeast corner of the landfill reveal that the wetlands have been contaminated with lead, chromium, silver, zinc, and various semi-volatile organic compounds at levels greater than three times background wetland samples (Ref. 121, pp. 806-807, 870, 1795-1797, 2287, 2508, 3329, 3468, 4175-4176, 4211, 4217-4218, 4640, 4641, 4646-4647, 4653, 4655, 4658, 4895-4897, 4937-4938, 4974, 4983, 5015).

Non-permitted uncontrolled drainage from the landfill can be observed by reviewing historical aerial photographs, former landfill inspection notes/reports, and past inspector statements (Ref. 8;12, pp. 1, 2, 13, pp. 1-5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 30, pp. 2, 3, 8, 14, 15; 39, pp. 8, 9, 10; 71, pp. 4, 6, 7; 91, p. 1; 93, p. 3; 94, p. 3; 99; 132, p. 1; 150, p. 1).These inspection reports and statements reveal that leachate from the hazardous waste deposition areas of the landfill, had come in contact with ponded waters of the pit (Ref. 117, p.2). The operator pumped these discharging waters, which had come in contact with contaminants (i.e. via leachate from the landfill) into the Grand Calumet River. A historical aerial photograph taken in 1965 shows an active sand mine (Ref. 9). The photograph shows that the eastern half of the mined-out sand pit was filled with water. No sand mine was present when observing aerial photographs taken in 1954 and 1958 (Ref. 4; 5).

According to IDEM records, in 1974 a letter was issued to the operator of GDL, Larry Hagen granting final approval to Gary Development Company, to allow landfill operations to begin. An aerial photograph taken 11-14-75 shows landfill activities had begun including pit dewatering. The photograph shows that pit dewatering occurred on the eastern half of the GDL property. Drainage in the form of a white narrow stream can be observed within the northern portion of the Grand Calumet River emanating from the southeast corner of the landfill property (Ref. 3, p. 1).

The 1975 and 1986 historical aerial photographs show that the landfill is active and that a large area of standing water bisects two active filling areas (Refs. 3; 6). The two aerial photographs show that drainage from the GDL is not adequately controlled allowing drainage into the Grand Calumet River along the southeast portion of the GDL property (notice small drainage rill south of the haul road/also notice small amount of sedimentation of the haul road is occurring into the Grand Calumet River on the southeast side of the GDL property (Ref. 3; 6). Historical 1975 and 1989 aerial photographs show that uncontrolled drainage was entering the Grand Calumet River. Inspection reports during this time period (1985 to 1989) indicate that leachate was occurring and ponding on the property (Ref. 68, pp. 2, 10, 11, 13, 15, 16, 17, 18, 19, 20, 22, 27, 28, 30, 31, 32, 34, 35, 36, 37, 38, 40, 41, 50, 52, 54, 55, 56, 57, 61, 73, 75, 77, 81, 83, 84, 85, 89, 97, 98, 105; 72, p. 3; 78, pp. 5, 6; 108, p. 1; 109, p. 2; 112, p. 5). The inspection reports also state that the operator was told not to allow drainage from the GDL to enter the Grand Calumet River (Ref. 68, pp. 2, 16, 22, 31, 32, 37, 38, 64).

Landfill materials were observed to have been pushed into the adjacent wetland (Ref. 11 pp.8, 9). Hazardous substances associated with the landfill material could have been deposited directly into the wetland when these materials were pushed into the wetland. Pictures show rills, gullies, and depositional areas in the wetland area. (Ref. 11, pp. 8, 9).

An aerial photograph taken on May 11, 1989 shows a point discharge from the southeast corner of the GDL property. The photograph shows a surface water collection pond along the southeast corner of the GDL property. This pond corresponds to a 2-11-85 certified engineering drawing for the landfill (Ref. 68. p. 102). The drawing is also showing an internal drainage outfall from the pond. The outfall which was documented during the time when the landfill was active, is no longer present because it was been filled in some time after 1989 (Ref. 3; 116, pp. 1, 2; Figure 1 of this Documentation Record). The current location of the outfall was determined by reviewing historical aerial photographs that showed a discharge from the landfill, from past inspection reports, and from an interview with a past state inspector, who currently is an

Assistant Commissioner of IDEM (Ref. 12, p. 2; 27, p. 4; 99). A certified engineer's drawing confirms the location of the outfall (Ref. 68, p. 102). Since the exact location of the PPE is no longer present, the former location of the outfall was determined by triangulating the location of the PPE from historical photographs to present day photographs and reviewing past landfill inspector statements (Ref. 12, p. 2; 27, p. 4; 99; 114, pp. 1, 2, 3; 115, p. 1, 2; 117, p. 1). No discharge was observed in aerial photographs after 1989 (Ref. 116, Figure 1-1 of this Documentation Record). The photograph shows water is ponding southeast of the haul road and draining into the Grand Calumet River as a result of the existence of the internal outfall.

Basis for Chemical Analysis

Observed releases to the adjacent wetland have been documented by chemical analysis of sediment samples collected during the 2009 Expanded Site Inspection (ESI).

IDEM conducted an ESI on May 5, 2009 (Ref. 121, pp. 11, 14, 26, 27, 28, 29, 52 through 91; 46, pp. 1 through 40). During the ESI, sediment samples were collected from the adjacent wetland area and from wetlands that were considered background, located east of the adjacent wetlands (Ref. 121, pp. 26, 27, 28, 29; 46, 1-40). Analytical data from the 2009 ESI sampling event supports an observed release by chemical analysis to the adjacent wetland (Ref. 121, pp. 806-807, 870, 1795-1797, 2287, 2508, 3329, 3468, 4175-4176, 4211, 4217-4218, 4640, 4641, 4646-4647, 4653, 4655, 4658, 4895-4897, 4937-4938, 4974, 4983, 5015).

Background Samples:

Background wetland sediment samples were collected during the May 2009 ESI (Ref. 121, pp. 62, 63, 64, 65; 46, pp. 1, 2, 7). The background wetland samples were collected in wetland areas located along the south and north sides of the Grand Calumet River just east of Gary Development Landfill (46, pp. 1, 2, 7). According to IDEM's wetlands specialists, the background samples were obtained from the same type of wetlands as those located at the southeast corner of the Gary Development Landfill (Ref. 43, p. 1; 44, pp. 2, 3). The Grand Calumet River predominantly flows from east to west (Ref. 92, p. 5; 95, p. 46). The background samples were collected on the east branch of the Grand Calumet River. Although the Grand Calumet River is known to sometimes reverse its flow, reversal of flow in the Grand Calumet River only occurs on the West Branch of the Grand Calumet River (Ref. 95, pp. 39, 46). All background samples collected were obtained upstream from the PPE. The background samples were collected from 1,930 feet (samples ME2QQ7) to as far as 8,115 feet (samples ME2QQ1 and E2QQ2/ME2QQ2) feet upstream from the PPE (Ref. 142, p. 2).

The background samples were collected from 0-12 inch and 12 to 24 inch intervals of sediment and were of the same general soil description as the other wetland samples (Ref. 46, pp. 1, 2, 7). Eight background sediment samples were obtained for the 2009 ESI. However only four samples were selected to represent background sediment levels because they were found to contain the highest concentrations of contaminants of concern. These background sediment samples include ME2QQ2, E2QQ2, ME2QQ1, and ME2QQ7 (Ref. 121, pp. 53, 62, 63, 64, 65; 46, pp. 1, 2, 7).The background samples were obtained in the Grand Calumet River upstream from the Gary Development Landfill and were obtained in similar depositional areas where the target wetland samples were obtained.

The 0-12 inch samples from the adjacent wetland were compared to the 0-12 inch samples collected from the background samples, and the 12-24 inch samples from the adjacent wetland were compared to the 12-24 inch samples collected from the background samples.

A comparison of the background sediment samples and the adjacent wetland sediment samples reveal that the samples were obtained from the same type of wetland (PEMF) and show relatively comparable ranges of sediment properties (Ref. 131, p. 1; 46, pp. 1 through 40).

The following tables depict the wetland samples used as background wetland samples. The background samples contained various concentrations of SVOCs and metals. The background samples depicted in the table represent those samples which had the highest concentration of analytes. The table depicts the sample IDs, locations, and sample characteristics.

Background Sediment Sample Location and Comment Table

EPA Number	IDEM Control	Sample Location	Comments	Percent Solids	References
ME2QQ2	SDA2	60 feet west of airport strobe light at east end of runway	Color: black-10YR2/1*; inundated; sample obtained from 12 -24 inches; dominant vegetation is phragmites;	38.4 %	Ref. 46, p. 2; 121, pp. 62, 63; 121, p. 4173
E2QQ2	SDA2	60 feet west of airport strobe light at east end of runway	Color: black-10YR2/1*; inundated; sample obtained from 12 -24 inches; dominant vegetation is phragmites;	29 %	Ref. 46, p. 2; 121, pp. 62, 63; 121, p. 4634
ME2QQ1	SDA1	60 feet west of airport strobe light at east end of runway	Color: black-10YR2/1*; inundated; sample obtained from 0 -12 inches; dominant vegetation is phragmites;	21.6 %	Ref. 46, p. 1; 121, pp. 64, 65; 121, p. 4173
ME2QQ7	SDD1	Southwest corner airport property	Color: black-10YR2/1*; inundated; sample obtained from 0-12 inches; dominant vegetation is phragmites	17.4 %	Ref. 46, p. 7: 121, p. 4174

* 10YR2/1 are color codes derived from the Munsell Color Chart (Ref. 147).
Note: The background samples listed are only those background samples which contain the highest concentrations of each contaminant used for scoring.

All samples were collected using the same protocols and were analyzed for the same parameters. The samples were analyzed for metals according to CLP SOW ILM05.4 and for SVOCs, pesticides, and PCBs according to CLP SOW SOM01.2 (6/2007) and reviewed according to the National Functional Guidelines for Inorganic Data Review for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.3) (Ref. 121, p. 4166, 4601; 130, p. 2; 129, p. 2). The wetland samples were sent to EPA's Test America and SVL Analytical laboratories for the above-mentioned analysis (Ref. 121, pp. 199 through 5025).

Sediment samples ME2QQ2, E2QQ2, ME2QQ1, and ME2QQ7 were obtained for the May 2009 ESI (Ref. 121, pp. 53, 62, 63, 64, 65; 46, pp. 1, 2, 7). These samples, which were collected upstream from the Gary Development Landfill, are considered reference background wetland samples. Even though these samples do not represent natural background due to the high lead, chromium, and SVOC levels, there is still a three fold increase in the concentration of contaminants in the southeast adjacent wetland samples when compared to these samples. The samples were collected in an area east of the Gary Development Landfill property on the north and south side of the Grand Calumet River, east of the railroad/toll road bridge (Ref. 46, pp. 1, 2, 7).

Sample Location and Depth Table

Sample ID	Percent Solids	Sample Location	Depth	Date	Reference
ME2QQ2	38.4 %	60 feet west of airport strobe light at east end of runway	12-24 inches	5-5-2009	Ref. 46, p. 2; 121, pp. 62, 63; 142
E2QQ2	29 %	60 feet west of airport strobe light at east end of runway	12-24 inches	5-5-2009	Ref. 46, p. 2; 121, pp. 62, 63; 142
ME2QQ1	21.6 %	60 feet west of airport strobe light at east end of runway	0-12 inches	5-5-2009	Ref. 46, p. 1; 121, pp. 64, 65; 142
ME2QQ7	17.4 %	Southwest corner Airport property	0-12 inches	5-5-2009	Ref. 46, p. 7; 121, p. 53; 142

- Background Concentration Levels

The table below provides a summary of the concentrations of hazardous substances detected in the background wetland samples collected from east of the adjacent wetland during the 2009 ESI. The analytical data package and data validation report from the sampling event are provided in Reference 121. All samples analyzed for metals were analyzed using the U.S. EPA Contract Laboratory Program (CLP) SOW ILM05.4 Analysis Procedures (Ref. 121, p. 4166). All samples analyzed for semi-volatile organic compounds were analyzed using the CLP SOW SOM01.2 (6/2007) and reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.3) (Ref. 121, p. 4601).

Background Concentration Level Table

Sample ID	Hazardous Substance	Sample Concentration	Adjusted Sample Concentration	Sample Quantitation Limit (SQL)	References
ME2QQ2	Chromium (Total) Silver	472 mg/kg 2.6 (U) mg/kg	Not Applicable Not Applicable	2.604 mg/kg 2.604 mg/kg	Ref. 121, pp. 4165-4173, 4202
E2QQ2RE	Acenaphthene Anthracene Benzo(a)Anthracene Benzo(a) Pyrene Benzo (b)Fluoranthene Benzo(k)Fluoranthene Chrysene Fluoranthene Fluorene Phenanthrene Pyrene	14,000 ug/kg (J) 17,000 (UJ) ug/kg 17,000 (UJ) ug/kg 4,700 (J) ug/kg 7,100 (J) ug/kg 5,700 ug/kg 9,000 ug/kg (J) 15,000 (J) ug/kg 17,000 (UJ) ug/kg 17,000 (UJ) ug/kg 11,000 ug/kg (J)	**65,520 ug/kg** Not Applicable Not Applicable **4,700 ug/kg** **7,100 ug/kg** **5,700** **9,000 ug/kg** **15,000 ug/kg** Not Applicable Not Applicable **130,460 ug/kg**	17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg 17,586.207 ug/kg	Ref. 121, pp. 4601-4611, 4634, 4635, 4636, 4637
ME2QQ1	Chromium (Total) Zinc	185 mg/kg 1,020 mg/kg	Not Applicable Not Applicable	4.629 mg/kg 27.777 mg/kg	Ref. 121, pp. 4165-4173, 4201
ME2QQ7	Lead Silver	362 mg/kg 5.7 (U) mg/kg	Not Applicable Not Applicable	5.747 mg/kg 5.747 mg/kg	Ref. 121, pp. 4165-4172, 4174, 4207

ug/kg micrograms per kilogram
mg/kg milligrams per kilogram
U The analyte was analyzed for, but was not detected above the reported contract required detection limit (CRDL).

J The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample (Ref 121, p. 4633).

UJ The analyte was not detected above the reported SQL. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample (Ref. 121, p. 4633).

Concentrations that are bolded are based on the adjustment factors found in the EPA fact sheet "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 145). Because no direction of bias was indicated for the J-qualified data (Ref. 121, pp. 4601-4611), the values were adjusted upward in accordance with the fact sheet.

- Contaminated Sediment Samples

Sediment Sample Comment and Location Table

Sample ID	Percent Solids	Sample Location	Distance from the PPE, feet	Comments	Depth	Date	References
E2QS2	42 %	South of first grouping of trees past end of the road; north of E2QR1	169.92	Color: black-10YR2/1*; solvent odor; inundated ; sample collected from 12-24 inches; predominant vegetation is phragmites	12-24 inches	5-5-2009	Ref. 46, p. 20
ME2QR9	40.6 %	Southeast of first grouping of trees east end of access road, southern most sample location, east of sample E2QR1	261.73	Color: black-10YR2/1*; slight petroleum odor, sheen on water; inundated; sample obtained from 0-12 inches; predominant vegetation is phragmites	0-12 inches	5-5-2009	Ref. 46, p. 17
ME2QS0	43.7 %	Southeast of first grouping of trees east end of access road, southern most sample location, east of sample E2QR1	261.73	Color: black-10YR2/1*; petroleum odor, sheen on water; inundated; sample obtained from 12-24 inches; predominant vegetation is phragmites	12-24 inches	5-5-2009	Ref. 46, p. 18
ME2QR3	35.2 %	South of first grouping of trees past end of access road, over half way to the river	185.89	Color: black-10YR2/1*; oil sheen observed on water; petroleum odor; sample collected from 12-24 inches; predominant vegetation is phragmites	12-24 inches	5-5-2009	Ref. 46, p. 11

The percent solids for the metals were obtained from the analytical results found on their respective pages. The percent solids for the organics were obtained by taking 100 minus the percent moisture found in the analytical results.

Using GIS software, the distance between the PPE and each sample location was measured. (Refs. 125, p.2; 152).

* Note: 10YR2/1 is the color code derived from the Munsell Color Chart (Ref. 147).

Contaminated Samples- All samples analyzed for metals were analyzed using the U.S. EPA Contract Laboratory Program (CLP) SOW ILM05.4 Analysis Procedures (Ref. 121, p. 4166). All samples analyzed for semi-volatile organic compounds were analyzed using the CLP SOW SOM01.2 (6/2007) and reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.3) (Ref. 121, p. 4601).

Contaminated Sediment Concentration Table

Sample ID	Sample Medium	Hazardous Substance	Hazardous Substance Concentration	SQL	Benchmark for SW Environmental Ref. 2, App. BII	References
E2QS2	Sediment	Acenaphthene Anthracene Benzo(a)Anthracene Benzo(a)Pyrene Benzo(b)Fluoranthene Benzo(k)Fluoranthene Chrysene Fluoranthene Fluorene Phenanthrene Pyrene	480,000 ug/kg 270,000 ug/kg 600,000 ug/kg 540,000 ug/kg 700,000 ug/kg 500,000 ug/kg 630,000 ug/kg 2,000,000 ug/kg 440,000 ug/kg 460,000 ug/kg 1,100,000 ug/kg	115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg 115,580.21 ug/kg	Not Applicable Not Applicable Not Applicable Not Applicable Not Applicable Not Applicable Not Applicable Not Applicable Not Applicable Not Applicable Not Applicable	Ref. 121, pp. 4602, 4646, 4647, 4655, 4937, 4938,
ME2QR9	Sediment	Chromium Lead Silver Zinc	1,720 mg/kg (J) **(1,333 mg/kg)∗** 1,740 mg/kg 11.7 mg/kg 6,340 mg/kg	2.463 mg/kg 2.463 mg/kg 2.463 mg/kg 14.778 mg/kg	Not Applicable Not Applicable Not Applicable Not Applicable	Ref. 121, pp. 4165-4172, 4176, 4217
ME2QS0	Sediment	Chromium Silver	2,030 mg/kg (J) **(1,574 mg/kg)∗** 5.2 mg/kg	2.288 mg/kg 2.288 mg/kg	Not Applicable Not Applicable	Ref. 121, pp. 4165-4172, 4176, 4218
ME2QR3	Sediment	Silver	7.2 mg/kg	2.841 mg/kg	Not Applicable	Ref. 121, pp. 4165-4172, 4175, 4211,

Key

mg/kg	milligrams per kilogram
ug/Kg	micrograms per kilogram
NA	Not Applicable

The SQLs for the organic analysis (Semi-Volatile Organic Compounds (SVOCs) Pesticides, and Polychlorinated Biphenyls (PCBs)) were calculated utilizing methods described in Exhibit C "Target Compound List and Contract Requirement Quantitation Limits" pages C-1, C-7 – C-11, Exhibit D "Analytical Method for the Analysis of Semi-Volatile Organic Compounds" page D-48/SVOA, in CLP SOW SOM01.1 for Organic Analysis (Ref. 144) and information contained in Reference 121, pages 4634 – 4660.

The sample quantitation limits (SQLs) for metals analysis were calculated utilizing methods described on page 30 of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (Ref. 143) and information contained in Reference 121, pages 4173 – 4176.

∗ ME2QR9 Chromium Result Biased High and adjusted using the procedure described in EPA 540-F-94-028, *Using Qualified Data to Document an Observed Release and Observed Contamination*, November 1996 (Ref. 145).

∗ ME2QS0 Chromium Result Biased High and adjusted using the procedure described in EPA 540-F-94-028, *Using Qualified Data to Document an Observed Release and Observed Contamination*, November 1996 (Ref. 145).

Attribution:

Manifests, court documents, and other cited information from IDEM files demonstrate that hazardous materials have been deposited into the landfill (Ref. 21, pp. 1, 2; 18; 19; 22, pp. 7, 8, 9, 10, 11, 12, 13, 22, 23, 18, 19, 20, 21, 22, 28, 29, 30, 31, 36, 37, 43, 50, 52, 54, 59; 23, p. 5; 27, p. 2; 33, p. 2; 30, p. 5; 31, p. 3; 33, p. 2; 34, pp. 2, 4; 55, pp. 1 through 38; 57, pp. 3, 4; 61, pp. 3, 4, 5, 6; 63, p. 1; 64, p. 1; 65, pp. 1 through 8; 66, p. 1; 67, pp. 1, 2; 70, pp. 3, 5, 6, 7; 75, p. 2; 84. p. 1; 79, pp. 14, 15; 81, p. 17; 86, p. 13;). Historical aerial photographs, inspection reports, and past inspectors statements reveal that non-permitted drainage (leachate, runoff that would have come in contact with waste material, etc.) was allowed to discharge from the facility into the adjacent wetland located at the southeast corner of the of the GDL property (Ref. 8; 12, pp. 1, 2; 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 30, pp. 2, 3; 39, pp. 8, 9, 10; 78, pp. 5, 6; 90, p. 3; 91, p. 1; 93, p. 3; 94, p. 3; 99; 106, pp. 1, 7, 10; 132, p. 1; 150, p. 1). The operator also installed a culvert under the access road to discharge drainage from the landfill into the Grand Calumet River (Ref. 12, p. 2; 27, p. 4). No NPDES permit was ever obtained.

Analysis of the wetland sediment samples obtained at the southeast corner of the landfill revealed elevated levels of the same substances that were deposited in the landfill (Ref. 121, pp. 806-807, 870, 1795-1797, 2287, 2508, 3329, 3468, 4175-4176, 4211, 4217-4218, 4640, 4641, 4646-4647, 4653, 4655, 4658, 4895-4897, 4937-4938, 4974, 4983,; Section 2.2.1 of this HRS documentation record).

Because of the highly permeable nature of the Calumet aquifer, geologic conditions beneath the landfill were not appropriate for the disposal of a hazardous waste (Ref. 92, p. 7). Because of the fact that an engineered liner was never installed at the landfill, and the landfill cap is incomplete and not maintained, in addition to the direct discharge, the landfill may have leaked hazardous substances into the adjacent wetlands located at the southeast corner of the landfill (Refs. 71, pp. 5, 6; 78, pp. 3, 4, 5, 6, 7, 8; 92, p. 7; 117, pp. 2, 3; 141, p.1).

There are 8 other possible sources of hazardous substances that have been identified in the area. Descriptions and locations of the possible sources are as follows (Refer to Reference 146 for a location of each possible source):

1) Ninth Avenue Dump (EPA ID: IND980794432): The Ninth Avenue Dump is located approximately 6000 feet south of the Gary Development Landfill (Reference 146). Hazardous waste disposal occurred at this NPL site from the early to mid 1970's (Ref. 138, p. 13). The facility operator reportedly accepted dry industrial wastes, construction and demolition debris, liquid industrial wastes (Ref. 138, p. 13). Soils were found to be contaminated with a variety of VOCs, polycyclic aromatic hydrocarbons (PAHs), and PCBs (Ref. 138, p. 13). Ground water was found to be contaminated but the contamination did not extend beyond the original operating area. Surface water was found to present no significant risk to human health. (Ref. 138, p. 14).

2) Conservation Chemical (EPA ID: IND040888992): Conservation Chemical is located 4000 feet north of the wetlands that lie adjacent to the southern perimeter of the Gary Development Landfill (Reference 146). The company began operations in 1967 and operated the facility as a ferric chloride producer (Ref. 137, p.103). In 1975, the company ceased ferric chloride production and began operations as a hazardous waste terminal and treatment facility for cyanide, organic solvents, plating wastes, and waste oils (Ref. 137, p.103). Regulations in 1980 forced the company to stop the transport of hazardous waste (Ref. 137, p.103). In 1983 the Gary Municipal Airport Authority conducted a hazardous waste assessment at the Conservation Chemical Company for possible acquisition of the property for airport expansion (Ref. 137, p.103). No overland flow to the nearby surface water was noted. Conservation Chemical has undergone remediation under an administrative order between the responsible parties and EPA (Ref. 137, p. 106).

3) Gary Municipal Airport (GMA) (EPA ID: IND067469437): Gary Municipal Airport is located approximately 900 feet east of the Gary Development Landfill (Reference 146). According to an inspection by an EPA contractor on April 8, 1987, oily waste was observed in a ditch located on Airport property (136, p. 2). Any oily waste in the ditch would have entered into the Grand Calumet River at a point upstream from the Gary Development Landfill. Contaminants detected in upstream samples that were obtained from the Grand Calumet River during the Gary Development Landfill

Expanded Site Inspection were found to be lower than three times the wetland samples, indicating that the GMA is not expected to be a source of the contamination in the wetlands adjacent to the Gary Development Landfill (Refer to the Contaminated Sediment Concentration Table found in Section 4.1.2.1.1).

4) Site # 95 (AKA City Service refinery tank bottom dump) (EPA IND980500151): Site number 95 is located approximately 450 feet due north of the Gary Development Landfill (Reference 146). City Service Company allegedly used a tar pit and a caustic pit for waste disposal (Ref. 135, pp. 6, 12). The contents of the tar pit (oily waste and sludge from petroleum refining tank bottoms) were mixed with soil and either deposited in piles or land-spread over a 7 acre disposal area (Ref.135, pp. 6, 12). An unnamed drainage ditch was located along the western edge of the property (Ref.135, pp. 6, 12). This drainage ditch enters a culvert near the southern border of the property and is piped underground to the southwest under Cline Avenue (Ref.135, pp. 6, 12). This pipe discharged into an access structure located near the northwest corner of the Cline Avenue interchange (Ref.135, pp. 6, 12). This location is to the west of the Gary Development Landfill (Ref. 146).

5) Roland Dump (AKA Site #73)(EPA ID: IND98050057): Roland Dump is located approximately 5500 feet north-northeast of the Gary Development Landfill (Reference 146). Roland Dump was a pit that may have been used for sand excavation at one time was filled with water and was being utilized as a dump for demolition debris, refuse, foundry sand, and hazardous waste (Ref. 134, pp. 1, 2). Migration of hazardous substances into the ground water was suspected because of the sand aquifer and the shallow ground water table (4-6 feet) (Ref. 134, pp. 1, 2). Migration of hazardous substances from the property to the Grand Calumet River was considered unlikely because no drainage route existed (Ref. 134, p. 2).

6) Vulcan Materials (AKA AMG) (IND005444732): Vulcan Materials is located west of and adjacent to the Gary Development Landfill and is located at 459 Cline Avenue (Reference 146). The Vulcan Materials Company (VMC) was a steel detinning facility (Ref. 133, pp. 9, 12). Caustic mud slurry that was generated from the operations was placed in an unlined storage pond for the evaporation of water (Ref. 133, p. 12). In December 1979, the Gary Development Landfill operator notified the Indiana State Board of Health of a leachate flow from the Vulcan Materials Company property (Ref. 133, p. 12). At the time the VMC was inspected by EPA personnel in 1980, no direct correlation could be made to indicate that leachate was flowing from the Vulcan materials Company storage pond to the west side of the Gary Development Landfill (GDL) property (Ref. 133, p. 12). Sampling conducted by US EPA contractor indicated that soils have been impacted significantly by SVOCs (Ref. 133, p. 51). However, it was concluded that the SVOCs were not a result of the detinning process (Ref. 133, p. 51). Currently the property is being used as metal recycling facility and the name of the facility is now AMG (Ref. 151). Since Vulcan Materials is located adjacent and west of the Gary Development Landfill, any surface water runoff from this facility would be expected to enter the Grand Calumet River downstream from the Gary Development Landfill (Ref. 3; 146).

7) MIDCO I (EPA ID: IND980615421) – MIDCO I is located approximately 8000 feet due south of the Gary Development Landfill (Reference 146). This NPL site includes a four-acre area where disposal occurred and an adjacent contaminated wetland area (Ref. 139, p. 1). From 1973 through 1979, this site was used for the storage of waste solvents and other wastes in tanks and in drums (Ref. 139, p. 1). Following removal of the surficial wastes, the subsurface soils and groundwater were still found to be highly contaminated with volatile organic compounds, chromium, lead and nickel (Ref. 139, p. 1). Nearby sediments were contaminated with similar contaminants as well as PCBs, polyaromatic hydrocarbons, and chlordane. Volatile organic compounds, chromium, lead, cadmium, and cyanide were detected in surface waters northeast of the site (Ref. 139, p. 1). Contaminants in the soil are leaching into the ground water (Ref. 139, p. 1). Until the site is cleaned up, risks to humans by direct contact or accidental ingestion of contaminated ground water, surface water, sediments, or soils is currently controlled by a site fence, on-site staff, and a temporary soil cover. Contaminated sediments are not migrating off-site (Ref. 139, p. 1). Based on the facility's location (Ref. 146), any potential runoff from this facility is not expected to enter the Grand Calumet River in the vicinity of the Gary Development Landfill.

8) Midco II (IND980679559) – Midco II is located approximately 4500 feet northeast of the Gary Development Landfill (Reference 146). This NPL site includes a 7-acre disposal area (Ref. 140, p. 1). This site was used for the storage of waste solvents and other wastes in tanks and drums, storage of reclaimable materials, neutralization of acids and caustics, and dumping of wastes (Ref. 140, p. 1). Following removal of surficial wastes, the subsurface soil and ground water were found to be highly contaminated (Ref. 140, p. 1). Contaminants affecting ground water include VOCs and some metals, Sediments and soils are contaminated with similar substances as well as PCBs and polyaromatic hydrocarbons (Ref. 140, p. 1). Until the site is cleaned up, risks to humans by direct contact or accidental ingestion of contaminated ground water, surface water, sediments, or soils is currently controlled by a site fence, on-site staff, and a temporary soil cover. Contaminated sediments are not migrating off-site (Ref. 140, p. 1). Based on the facility's location and intervening structures (Ref. 146), this facility is not expected to contribute runoff to the Grand Calumet River in the vicinity of the Gary Development Landfill.

Based upon the information provided above and the facility locations shown on Reference 146, the contaminants found in the observed release to the wetlands adjacent to the Gary Development Landfill are not expected to have come from any of the other cited facilities.

Hazardous Substances Released:

The following hazardous substances have been released:
Acenaphthene, Anthracene, Benzo(a)Anthracene, Benzo(a)Pyrene, Benzo(b)Fluoranthene, Benzo(k)Fluoranthene, Chrysene, Fluoranthene, Fluorene, Phenanthrene, Pyrene, Chromium, Lead, Silver, and Zinc.

Surface Water Observed Release Factor Value: 550

4.1.4 Environmental Threat

4.1.4.2 Environmental Threat Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

The ecosystem toxicity and persistence values, the environmental bioaccumulation values, and the ecosystem toxicity/persistence/bioaccumulation factor values for all hazardous substances associated with the Source that have a surface water containment value greater than zero (0) is presented in the table below. The combined ecosystem toxicity/persistence/bioaccumulation factor values were obtained from HRS Table 4-21 (Ref. 1, Section 4.1.4.2.1.4, p. 51623).

Hazardous Substance	Source No.	Ecosystem Toxicity Factor Value	Persistence Factor Value*	Bioaccumulation Value**	Ecosystem Tox/Persistence /Bio Factor Value (Table 4-21)	References
Acenaphthene	1	10,000	.4	500	2,000,000	Ref. 1, p. 97; 2, p. 5
Anthracene	1	10,000	.4	50,000	200,000,000	Ref. 1, p. 97; 2, p. 27
Benzo(a)Anthracene (Benz(a)Anthracene)	1	10,000	1	50,000	500,000,000	Ref. 1, p. 97; 2, p. 39
Benzo(a)Pyrene	1	10,000	1	50,000	500,000,000	Ref. 1, p. 97; 2, p. 45
Benzo(k)Fluoranthene	1	0	1	50,000	0	Ref. 1, p. 97; 2 p.51

Chrysene	1	1,000	1	5,000	5,000,000	Ref. 1, p. 97; 2, p. 93
Fluoranthene (Benzo(j,k)fluorene	1	10,000	1	5,000	50,000,000	Ref. 1, p. 97; 2, p. 49
Fluorene	1	1,000	1	5,000	500,000	Ref. 1, p. 97; 2, p. 177
Phenanthrene	1	1,000	.4	50,000	20,000,000	Ref. 1, p. 97; 2, p. 277
Pyrene	1	10,000	1	50,000	500,000,000	Ref. 1, p. 97; 2, p.301
Chromium	1	10,000	1	500	5,000,000	Ref. 1, p. 97; 2, p. 87
Lead	1	1,000	1	50,000	50,000,000	Ref. 1, p. 97; 2, p. 227
Silver	1	10,000	1	50	500,000	Ref. 1, p. 97; 2, p. 315
Zinc	1	10	1	50,000	500,000	Ref. 1, p. 97; 2, p. 409

* The river persistence value was used since the nearest sensitive environment is the southeast adjacent wetland which is part of the Grand Calumet River.

**Bioaccumulation factor value for Freshwater

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 500,000,000 or 5×10^8

4.1.4.2.2 Hazardous Waste Quantity

Source No.	Source Type	Source Hazardous Waste Quantity
1	Landfill	38,902

Sum of Values: 38,902

Hazardous Waste Quantity Factor Value: 10,000
(Ref. 1, Section 2.4.2.2, Table 2-6)

4.1.4.2.3 Waste Characteristics Factor Category Value

The environmental waste characteristics factor value is obtained by multiplying the ecosystem toxicity/ persistence factor value and the hazardous waste quantity factor value for the watershed, subject to a maximum product of 1×10^8. Then multiply the product by the ecosystem bioaccumulation potential factor value for that hazardous substance, subject to a maximum product of 1×10^{12} (Ref. 1, Section 4.1.4.2.3, p. 51624). The product is assigned a waste characteristics factor category value from HRS Table 2-7 (Ref. 1, Section 2.4.3.1, p. 51592). The values presented below are for benzo(a)pyrene and mercury.

Ecosystem Toxicity/Persistence Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 10,000
Bioaccumulation Potential Factor Value: 50,000

10,000 (Ecotox) X 10,000 (Hazardous Waste Quantity is 10,000) = 1 x 10^8 X 50,000 (Bioaccumulation) = 5 X 10^{12}
Then enter 5 X 10^{12} into HRS Table 2-7
HRS Table 2-7 yields a waste characteristics factor category value of 1,000

Waste Characteristics Factor Category Value: 1,000
(Ref. 1, Table 2-7, p. 51592)

4.1.4.3 Environmental Threat Targets

4.1.4.3.1.1 Level I Concentrations

There are no Level I concentrations; therefore, Level I concentrations were not evaluated as part of this HRS Documentation Record.

4.1.4.3.1 Sensitive Environments

There are three sensitive environments identified that have been impacted by the Gary Development Landfill. The three environments are as follows:

1) Habitat known to be used by State designated endangered species, Marsh Wren (*Cistothorus palustris*) (Ref. 121, pp. 98, 151, 160, 161, 164).
2) Particular areas, relatively small in size, important to maintenance of unique biotic life (Grand Calumet River Corridor) (Ref. 121, p. 165, 166, 179).
3) Wetland (PEMF) (Ref. 7; 43; 44; 131, p. 1)

4.1.4.3.1.2 Level II Concentrations

Actual contamination is shown in the preceding sections by establishing an observed release by chemical analysis to wetland sediments and sensitive environments. Contaminants that meet the criteria for observed releases to the surface water pathway were detected in sediment samples (Section 4.1.2.1.1 of this HRS Documentation Record). Therefore, Level II concentrations are assigned (Ref. 1, Sec. 2, p. 51592). Please refer to the Contaminated Sediment Concentration Table found in Section 4.1.2.1.1 of this HRS documentation record.

A 2.83+/- acre wetland, is present by the southeast corner of the landfill property (Figure 1-2 of this HRS documentation record). This area meets the criteria for a wetland as defined by the Hazard Ranking System and as defined in 40 CFR Section 230.3, and is considered eligible for HRS scoring (Ref. 1, Table 4-24, p. 51625; 125, pp. 1, 2). This area is inundated and/or saturated by surface water at frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. This portion of the property contains hydrophytes in both hydric and non-hydric soils (Ref. 131, p. 1). A reconnaissance of the wetland was conducted by IDEM's wetland specialist. The wetland specialist indicated that this wetland is designated as PEMF (Ref. 131, p. 1).

This wetland has become contaminated with various concentrations of lead, chromium, zinc and numerous SVOCs as a result of continued discharge into the wetland from the Gary Development Landfill activities (Ref. 8; 12, pp. 1, 2, 13, pp. 1, 2, 3, 4, 5; 20, pp. 1, 2; 22, pp. 11, 15, 16, 22, 24, 25, 27, 39, 41, 53, 61, 62, 63, 87; 23, p. 19; 30, pp. 2, 3; 39, pp. 8, 9, 10; 90, p. 3; 93, p. 3; 94, p. 3; 97, pp. 1, 2; 98, pp. 1, 2; 132, p. 1; 150, p. 1).

A habitat known to be used by State designated endangered or threatened species meets the HRS definition of a sensitive environment (Ref. 1, Table 4-23, p. 51624). The wetland is considered an area/habitat known to be used by the marsh wren, *Cistothorus palustris*, a state designated endangered bird; it is suitable habitat for and is within the current range of this species (Ref. 121, pp. 117, 119, 136, 145, 151, 160, 161, 162,

164). The marsh wren is a wetland species that utilizes aquatic plants for nesting and feeding habitats and forages on or near the marsh floor (Ref. 121, pp. 160, 161). As such, it would be expected to contact wetland surface water and sediment. Also, the wetland area, a particular area, relatively small in size, is important to the maintenance of unique biotic communities. It is part of the Grand Calumet River Corridor (Ref. 121, pp. 165, 177, 179, 180).

The table below lists the sensitive environments that have been impacted and their associated sensitive environment values.

Sensitive Environment	Distance from PPE to Nearest Sensitive Environment	Reference	Sensitive Environment Value (Table 4-23)
Habitat known to be used by State designated endangered species, marsh wren (*Cistothorus palustris*)	0 ft.	121, pp. 160, 161, 164	50
Particular areas, relatively small in size, important to maintenance of unique biotic life (Grand Calumet River Corridor)	0 ft.	121, pp. 165, 166, 179	25

The PPE is in the wetland sensitive environment. There is evidence that numerous state designated endangered or threatened species, are also in the area (Ref. 121, pp. 95 through 112, 119 through 152, 155, 156, 160 through 163, 166 through 169). It is unclear whether these species remain in the GDL area at this time.
Sum of sensitive environment values: 50 + 25 = 75

Sum of Level II Sensitive Environments Value: 75

Wetlands

Wetland sediment samples E2QS2, ME2QR9, ME2QS0, and ME2QR3 meet the requirements for an observed release (Refs. 1, Section 2.3, p. 51589; Section 4.1.2.1.1 of this HRS Documentation Record). The total length of wetlands perimeter that is subject to Level II concentrations of hazardous substances is determined by measuring the distance from the PPE to sample location points E2QS2 to sample ME2QR9 to sample ME2QR3 and then back to the PPE (Ref. Figure 1-3 of this HRS Documentation Record). The perimeter of the wetlands outlined by connecting a line to the PPE and these three sample points represents a quadrilateral (Ref. 153; Figure 1-3 of this HRS Documentation Record). The perimeter of the wetland measured by this quadrilateral that is subject to Level II concentrations is 532.32 feet or .1008 miles (Ref. Figure 1-3 of this HRS Documentation Record). The distance from the PPE to each of the three (3) sample points and back to the PPE was calculated using GIS software, and the total length of the wetland perimeter was measured. (Refs. 125, p. 2; 153). The assigned HRS wetland value for Level II concentrations is 25 (Ref. 1, Table 4-24, p. 51625).

Wetland	Wetland Perimeter (ft)	Wetland Perimeter (miles)	Reference
PEMF	532.32	0.1008	Figure 1-3 of this HRS documentation record

Notes:
Sum of Level II Wetland Perimeter: 169.92 + 91.81 + 84.70 + 195.89 = 532.32 = 0.1008 miles
Wetlands Value (Ref. 1, Table 4-24): 25

Sum of Level II Sensitive Environments Value + Wetlands Value: 75 + 25

Level II Concentrations Factor Value: 100

5.0 SOIL EXPOSURE PATHWAY

The soil exposure pathway was not evaluated as part of this HRS Documentation Record.

6.0 AIR MIGRATION PATHWAY

The air migration pathway was not evaluated as part of this HRS Documentation Record.